

REMARKS/ARGUMENTS

Reconsideration of this application in light of the above amendments and following comments is courteously solicited.

The invention as claimed in amended claim 1 is directed to a copper alloy consisting essentially of 58 to 66 wt% of copper, 0.1 to 0.8 wt% of tin, 0.01 to 0.5 wt% of silicon, at least one of 0.3 to 3.5 wt% of lead and 0.3 to 3.0 wt% of bismuth, at least one of 0.02 to 0.15 wt% of phosphorus, 0.02 to 3.0 wt% of nickel and 0.02 to 0.6 wt% of iron, the total amount of phosphorus, nickel and iron being in the range of from 0.02 to 3.0 wt%, and the balance being zinc and unavoidable impurities, wherein a proportion of an alpha phase is 80 vol% or more. Such a copper alloy has an excellent corrosion cracking resistance and an excellent dezincing resistance while maintaining excellent characteristics of conventional brasses.

Claims 1, 2, 4 and 5 were rejected under 35 U.S.C. §103 as being unpatentable over USP 4259124 to Smith et al, and Claims 1-5 were rejected under 35 U.S.C. §103 as being unpatentable over JP 60194035.

Smith discloses an alloy consisting essentially of 0.1 to 2.0% by weight tin, 0.1 to 2.0% by weight silicon, 20 to 34% by weight zinc, and the balance copper, wherein the content of alpha-phase within the alloy is at least 90% by weight. However, Smith fails to disclose or suggest that the alloy contains at least one of 0.3 to 3.5 wt% of lead and 0.3 to 3.0 wt% of bismuth. Smith also fails to disclose or suggest that the alloy containing at least one of lead and bismuth contains 0.02 to 0.15 wt% of phosphorus, 0.02 to 3.0 wt% of nickel and 0.02 to 0.6 wt% of iron, the total amount thereof being in the range of from 0.02 to 3.0 wt%.

Lead (Pb) and bismuth (Bi) serve to improve the machinability or cutting workability of brasses, respectively.

If the amount of Pb is 0.3 wt% or more, it is possible to obtain a good free-cutting workability. However, if the amount of Pb exceeds 3.5 wt%, the mechanical properties of brasses deteriorate to tend to cause embrittlement. Therefore, the amount of Pb is preferably in the range of from 0.3 to 3.5 wt%. For the same reasons, if the amount of Bi is in the range of from 0.3 to 3.0 wt%, it is possible to obtain a good free-cutting workability.

Nickel (Ni) has the function of decreasing the size of crystal grains, and also has the function of increasing the proportion of the alpha phase since the zinc equivalent of Ni is negative. If the amount of Ni is less than 0.02 wt%, it is not sufficiently obtain these functions. On the other hand, if the amount of Ni exceeds 3.0 wt%, there are problems on mechanical characteristics and adding costs. Therefore, the amount of Ni is preferably in the range of 0.02 to 3.0 wt%.

Phosphorus (P) has the function of improving the dezincing resistance of the alpha phase without damaging mechanical characteristics. However, if the amount of P is less than 0.02 wt%, it is not possible to obtain such a function, and if the amount of P exceeds 0.15 wt%, intergranular segregation is caused to deteriorate the ductility and stress corrosion cracking resistance of the alloy. Therefore, the amount of P to be added is preferably in the range of from 0.02 to 0.15 wt%.

Iron (Fe) has the functions of inhibiting the size of the alpha phase from being increased and of stabilizing mechanical characteristics. Since most of scrap materials include Fe, costs increase if the amount of Fe is less than 0.02 wt%, and the elongation of the alloy deteriorates if the amount of Fe exceeds 0.6 wt%. Therefore, the amount of Fe to be added is preferably in the range of from 0.02 to 0.6 wt%.

If the total amount of Ni, Fe and P is less than 0.02 wt%,

the use of scraps is restricted to increase costs. On the other hand, if the total amount exceeds 3.0 wt%, intergranular segregation is caused to deteriorate the ductility of the alloy. Therefore, the total amount of Ni, Fe and P is preferably in the range of from 0.02 to 3.0 wt%.

The copper alloy as claimed in claim 1 contains the above described elements so as to have an excellent corrosion cracking resistance and an excellent dezincing resistance while maintaining excellent characteristics of conventional brasses. However, Smith fails to disclose or suggest such a copper alloy.

JP 60194035 discloses a copper alloy consisting essentially of 63.0 to 66.0% by weight of copper, 0.7 to 1.2% by weight of tin, 1.0 to 2.5% by weight of lead, 0.1 to 1.0% by weight of iron, 0.1 to 0.7% by weight of nickel, 0.01 to 0.1% by weight of antimony, 0.01 to 0.2% by weight of phosphorus, and the balance being zinc and unavoidable impurities, the alloy having alpha-phase structure. However, JP 60194035 fails to disclose or suggest that the copper alloy contains 0.01 to 0.5 % by weight of silicon. That is, it is not disclosed in JP 60194035 (in Japanese) that the impurities contain Al, Mn, Si and S and that the total amount thereof is less than 0.5% by weight, although it is disclosed in Abstract of JP 60194035 (in English) that the copper alloy contains such elements as impurities.

Moreover, the copper alloy disclosed in JP 60194035 contains 0.01 to 0.1% by weight of antimony. That is, JP 60194035 fails to disclose or suggest any copper alloy consisting essentially of copper, tin, silicon, at least one of lead and bismuth, at least one of phosphorus, nickel and iron, and the balance being zinc and unavoidable impurities.

Accordingly, it is believed that the amended claims patentably distinguish the invention from the prior art.

An earnest and thorough attempt has been made by the

undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,
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I, Rachel Piscitelli, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:
"Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on June 13, 2006.

